

## - REPORT -

### Future Earth and ESA funded Workshop:

### Understanding the effect of environmental and climate change on coastal lagoon management: Potential and challenges for Earth Observation

**Activity number: 545-510:001**

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## Purpose of this document

This document reports on the successful completion of the Future Earth and ESA funded activity number: 545-510:001 (Workshop entitled: “Understanding the effect of environmental and climate change on coastal lagoon management: Potential and challenges for Earth Observation”) and outlines the scientific outcomes and any proposed follow-up actions.

## Background

Coastal lagoons are hotspots of human settlement and activities, influenced by both land input (e.g. nutrients, runoff, river management activities) and interaction with the sea (e.g. tides, sea pollution, erosion, storm surges and sea level change). Such dynamic systems are highly sensitive to environmental and climate change, but our understanding of how lagoons respond to change globally is limited. This understanding is necessary to sustainably manage lagoons, and the ecosystem services they provide, and assess the socio-environmental implications of future development in the context of global change. Remote sensing plays a key role in environmental monitoring and long-term climate change studies, but considerable knowledge gaps exist in exploiting the full potential of Earth Observation (EO) for coastal lagoon research. This activity aimed to close these gaps, and to strengthen joint research activities between the international Earth Observation and coastal zone research communities.

## Workshop

In 2017, the European Space Agency (ESA) and Future Earth programme funded a workshop with the aim to explore the potential and challenges for EO in coastal lagoon monitoring and management in the context of environmental and climate change. The workshop was hosted in the Centre for Marine and Renewable Energy (MaREI), Environmental Research Institute, University College Cork, Ireland, which has established an international reputation on hosting successful networking events and facilitated workshops, and it is also the base for the Future Earth Coasts (FEC) International Project Office. The award was received jointly by MaREI and FEC (the 'Hosts') in collaboration with the German Remote Sensing Data Center (DFD), German Aerospace Center (DLR). Other programmes that supported the activity proposal included Future Earth WATER FUTURE core project – Sustainable Water Future Programme (SWFP), Future Earth core project Programme on Ecosystem Change and Society (PECS), Future Earth core project Integrated Marine Biosphere Research (IMBeR) and Ireland's Marine Institute (MI).

The 3-day workshop took place between 12-14th September 2017 and was structured around three themes:

**Theme 1:** Lagoon monitoring and management issues;

**Theme 2:** The potential of Earth Observation for coastal lagoon monitoring and management; and

**Theme 3:** Challenges posed and potential identified solutions towards future research.

The workshop used practical ways to seek potential solutions to existing issues through keynote speeches, round-the-table discussions and small group breakout sessions. The keynote presentations are available on the new website related to this activity [www.lagoons4life.com/resources](http://www.lagoons4life.com/resources). Vulnerable coastal lagoon ecosystems around the world were chosen as case studies to carry out a hands-on assessment of the applicability of EO and other datasets (in-situ, auxiliary) in tackling these issues. ESA CCI ECVs that were discussed included SST, Ocean Colour, Sea Level and Land Cover, and information and data extracted in a study site (Curonian lagoon) was presented to showcase the potential of EO and ECVs, and inform the workshop discussions. The potential for new and emerging EO platforms (e.g. ESA Coastal-TEP and H2020 Co-ReSyF) and the ESA CCI Toolbox to provide data and processing tools was also discussed. Finally, a new scientific hub, the Lagoons Forum, was established during the workshop that includes all workshop participants (Appendix) and is expected to grow in the future.

## Scientific outcomes and deliverables

The key deliverables of the workshop were identified at the proposal stage as:

**D1: Establishment of international transdisciplinary network of scientists and researchers for the study of effects of environmental and climate change on global lagoon systems.**

This deliverable was successfully achieved and it is envisaged that the newly established network (Lagoons Forum) will prosper through new research collaborations as a result of interdisciplinary networking and collaborations beyond the workshop. To keep the Lagoons Forum active, the workshop participants have agreed to undertake the following actions:

- Use of social media (#lagoons4life and #L4L) and a dedicated website ([www.lagoons4life.com](http://www.lagoons4life.com)).
- Networking at relevant events.
- Organisation of special journal issues, special sessions and breakout workshops at international conferences (one special session has been submitted to the 2018 ASLO meeting - <https://aslo.org/page/aslo-2018-summer-meeting> - entitled "Unlocking the potential of

Earth Observation in coastal lagoons and estuaries” to stimulate further discussions on the workshop’s theme and increase awareness of the Lagoons Forum by the University of Stirling, FEC and MaREI).

- Future collaborations within research projects – a proposal is currently underway for a Belmont Forum and BiodivERsA 2017-2018 Joint Call (<http://www.biodiversa.org/1224>).

## **D2: Identification of key study areas and development of preliminary fieldwork plans towards pilot study**

This deliverable was initiated at the workshop and is still ongoing. During the workshop, 14 key coastal lagoons were identified as case studies and listed; this list is a living document and will continue to grow by including, for example, atoll lagoons. In addition, the workshop kicked-off the development of a dedicated lagoons database in order to identify sites that are well described, and others that aren’t, as well as to list available datasets and data sources and identify data gaps. The Lagoons Forum are now in the process of producing the first version of a lagoons database and a report describing same, which will be published on the Lagoons Forum website by the end of 2017.

## **D3: White Paper, or scientific review paper, on assessment of usefulness and applicability of EO data (including ESA CCI ECVs), open geodata and tools (e.g. ESA C-TEP) in lagoon monitoring and management**

During the three days of the workshop, constructive discussions covered aspects of the EO potential and challenges in coastal lagoon monitoring and management. In addition, a plethora of ideas, thoughts and issues to further explore were raised. Detailed notes taken at the meeting and recordings of the discussions are now being used towards authoring a White Paper based on the three themes of the workshop. Furthermore, the Lagoons Forum expressed their willingness to commit to future collaborations towards the generation of scientific papers.

## **D4: Collaborative research funding proposal focused on addressing the key gaps, opportunities and drivers identified by workshop discussions and outputs**

Funding opportunities were discussed during the activity and a list of potential funding bodies was compiled, however, no suitable research funding calls were identified at the time of discussions. Nevertheless, the activity and establishment of the Lagoons Forum, has enabled identification of collaborators and common thematic areas to be able to quickly respond to suitable research funding call(s) in the future. For example, as mentioned above, a proposal is underway for a Belmont Forum and BiodivERsA 2017-2018 Joint Call on “Scenarios of Biodiversity and Ecosystem Services” (<http://www.biodiversa.org/1224>).

## **Conclusion**

The 3-day workshop would not have been possible without the financial support of Future Earth and ESA. The Hosts and workshop participants are, therefore, grateful to Future Earth and ESA for the award. Overall, the funded activity brought together experts in EO and coastal research, including social scientists, and stimulated interesting discussions that aimed to address the potential of EO in monitoring and managing coastal lagoons globally. The workshop has identified a programme of activity needed to address this issue, avenues and pathways to continue doing so through international links and collaborations have now been identified: All participants at the workshop committed to support this on-going activity.



## Appendix

List of workshop participants:

NAME	ORGANISATION/AFFILIATION
Dr Martin Le Tissier	Future Earth Coasts (FEC), Marine and Renewable Energy Ireland (MaREI) centre, Environmental Research Institute (ERI), University College Cork (UCC)
Dr Eirini Politi	EO and GIS Applications Group, MaREI, ERI, UCC
Ms Juliane Huth	German Aerospace Center (DLR) German Remote Sensing Data Center (DFD)
Dr Gianmarco Giordani	Università degli studi di Parma, Italy
Mr Richard Lawford	Sustainable Water Future Programme (SWFP) Chair of the Data and Earth Observation Core Group, USA
Mr Giovanni Cecconi	Venice Resilience Lab, Università degli Studi di Trento, Italy
Prof James (Jai) Syvitski	Executive Director of the Community Surface Dynamics Modeling System (CSDMS); Chair of International Geosphere-Biosphere Programme (IGBP), USA
Mr Greg Beechinor	GEMS/Water Capacity Development Centre; University College Cork, Ireland (PhD student)
Mr Steve Groom	Director of the NERC Earth Observation Data Acquisition and Analysis Service (NEODAAS); Head of Node for the Airborne Research and Survey Facility; Head of Earth Observation Science, Plymouth Marine Laboratory, United Kingdom
Prof Andrew Tyler	Head of Biological & Environmental Sciences, University of Stirling, United Kingdom
Dr Sónia Cristina	Centre for Marine and Environmental Research (CIMA); University of Algarve, Portugal
Dr Carsten Brockmann	Brockmann Consult, Environmental Informatics and Geoinformation Services Director, Germany
Dr Cristoph Humborg	Scientific Director of the Baltic Sea Centre, Stockholm University, Sweden
Mark Schnerch	World Climate Research Programme (WCRP) Coastal Vulnerability group, World Meteorological Organisation (WMO), Cambridge, United Kingdom
Dr Paul DiGiacomo	NOAA/NESDIS Center for Satellite Applications and Research (STAR) Chief of Satellite Oceanography and Climatology Division (SOCD); CoastWatch/OceanWatch Program Manager; Marine Optical Buoy Project (MOBY) Manager and Group on Earth Observations (GEO) Blue Planet Co-Chair, USA
Prof Prateep Kumar Nayak	Human Dimensions Working Group, Integrated Marine Biosphere Research (IMBeR); University of Waterloo, Toronto, Canada
Mr Badr El Mahrud	Erasmus Mundus master student in Water and Coastal Management, University of Cadiz, Spain